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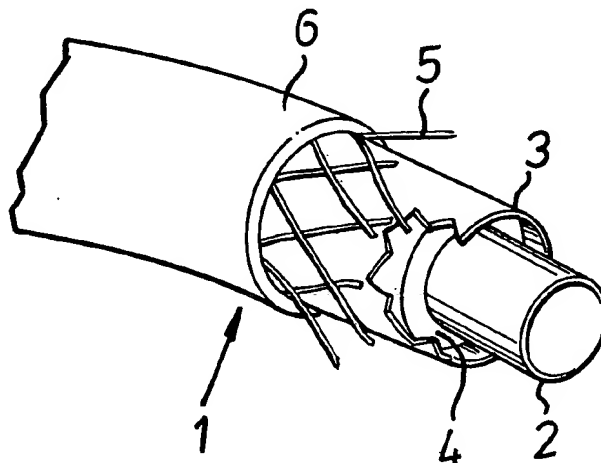
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## (54) Composite tubes

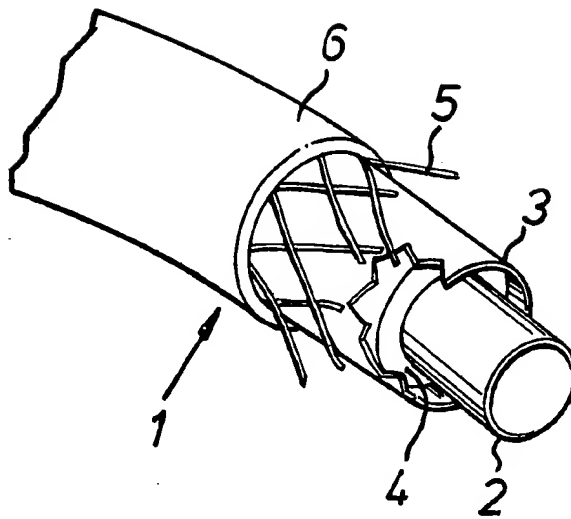
(57) A composite plastics tube (1) comprises an inner tube including an outer skin (3), an inner smooth skin (2), and sandwiched therebetween a foamed or expanded plastics layer (4), and an outer tube (6) of plastics

material applied onto the inner tube (2, 3, 4). Optionally the composite plastics tube further comprises a reinforcing layer (5) of, for example, braided textile yarn, between the outer skin (3) and the outer tube (6). The tubes use cheaper materials than hitherto to provide tubes of customary strength.



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# **SPECIFICATION** **Composite tubes**

The present invention relates to composite tubes and more particularly relates to tubes including an inner and an outer tube.

It is known to extrude plastics such as polyvinylchloride (P.V.C.) into tubular form. It is also known to extrude a first plastics tube, wrap a reinforcing covering such as a textile covering in the form of a braided textile yarn, for instance, nylon, around the first tube, and then to apply a second plastics, for example P.V.C., tube over the first tube by such processes as extruding and shrinking so that the material of the second tube passes through the apertures of the braid and forms with the first tube a homogeneous tube entrapping the reinforcing covering.

Such tubes may be made of clear plastics such as P.V.C. so that the passage of material through the tube may be observed or they may be made of coloured plastics having any desired colouring agent such as a pigment applied thereto or incorporated therein. It will be appreciated that either or both of the tubes may be coloured or alternatively the inner tube may be coloured while the outer tube is clear.

In all of the above discussed cases, the plastics such as P.V.C. is extruded as a tube and is of solid wall form.

It has also been known to extrude the inner tube in a foamed or expanded form and then apply onto the outer surface of the inner foamed tube a plastics, for example P.V.C. tube of a solid form. One of the disadvantages of such a composite tube is rough and may thereby impede the smooth flow of substances, in particular liquids there-through. Also, if the inner foamed or expanded tube is coloured, the appearance of the foamed or expanded tube when viewed through an outer clear tube may not be as pleasant as is otherwise required.

It is known that black is one of the cheapest colours for extruded plastics such as P.V.C. However, black is not always acceptable and to provide other colours for both the inner and outer tubes raises the cost of the composite tube product.

It is with some, or all of the above problems and disadvantages that the present invention is concerned and accordingly, the present invention provides a composite plastics tube comprising an inner tube including an inner smooth skin, an outer skin, and sandwiched therebetween a foamed or expanded plastics layer, and an outer tube of plastics material applied onto said inner tube.

Advantageously, the tube of the present invention further comprises a reinforcing layer between the outer skin of the inner tube and the outer tube. Preferably such a reinforcing layer is composed of a reinforcing textile yarn such as nylon braided onto the outer skin of the inner tube before the outer tube is applied thereon.

In accordance with the present invention, the

inner tube is formed substantially of expanded or foamed material, thus reducing the amount of material required to form the tube and is provided with an inner smooth skin and an outer, preferably also smooth, skin. By providing the tube with an inner smooth skin, a smooth flow through the inner tube may be obtained. By providing the outer, preferably smooth, skin which will generally be only a laminar layer of, for example, a coloured material, then only a small amount of colouring agent is required to give that colouring, so that the outer tube applied onto the inner tube may be clear.

Thus, the foamed or expanded plastics sandwiched between the inner and outer skins of the inner tube may be composed of the cheapest known materials such as, for example, black expanded P.V.C.

The outer tube of the composite tubes of the present invention may be applied onto the inner tube (and reinforcing layer if present) by any of the methods known in the art although it is preferably extruded or shrunk thereon.

In accordance with the present invention, a tube is obtained with all the necessary strength and qualities using the technique of expanded or foamed plastics whilst at the same time being able to use cheap materials and obtain any desired colour of the end product by the use of a colouring agent on the outer surface of the inner tube.

The inner foamed or expanded tube may be fabricated using any known method for forming such tubes and the inner and outer skins may be applied thereto using conventional techniques. However, it is preferred to extrude the foamed or expanded inner tube in sandwich form by providing a die in which the material from which the foamed or expanded tube is to be formed is passed along the centre thereof while immediately prior to the die, the material from which the inner and outer skins are to be formed is fed to the inner and outer surface of the die. The material fed to the inner and outer surfaces of the die thus forms a skin on the outer surface of the expanded or foamed material, as well as onto the inner surface thereof, thereby skinning the foamed or expanded material and forming a sandwich construction. It will be appreciated from the foregoing that the plastics material from which the various components of the composite tubes of the present invention are made is conveniently P.V.C. but equally, other plastics materials may be used.

The present invention will be further illustrated with reference to the sole accompanying drawing which shows a perspective, partly cut-away, view of a preferred embodiment.

Referring to the drawing, the composite tube, generally designated 1 has an inner tube consisting of an inner smooth P.V.C. skin 2, an outer smooth P.V.C. skin 3 and, sandwiched therebetween, a layer 4 of foamed P.V.C. A reinforcing nylon yarn 5 is braided onto the outer smooth skin 3. Extruded over the smooth outer skin 3 and also over the braided yarn 5 is an outer

P.V.C. tube 6 of solid form. The tube 1 shown in the drawing is made as follows. In order to extrude the inner tube 2, 3, 4, in sandwich form, a die is provided in which the P.V.C. material together with a colouring agent is passed along the centre of the die tube while immediately prior to the die P.V.C. material is fed to the inner surface and to the outer surface of that die. The P.V.C. material thus forms an outer skin 3 on the outer surface of the foamed material 4 and an inner skin 2 on the inner surface of the foam 4, thereby skinning the foamed material 4 and forming a sandwich construction. The nylon yarn 5 is then braided onto the outside of the outer skin 3 and thereafter the P.V.C. tube 6 of solid form is extruded over the yarn 5 and outer skin 3 in such manner that the material thereof passes through the apertures of the braided nylon 5 to form with the inner tube a homogeneous tube structure entrapping the nylon braid reinforcement 5.

It is thought that the present invention provides a particularly useful and relatively cheap and simple way of obtaining a plastics tube of the customary strength using materials which are cheaper than hitherto and at the same time providing versatility of colour combinations for the exterior appearance of the tube as required by the ultimate user.

#### CLAIMS

- 30 1. A composite plastics tube comprising an inner tube including an inner smooth skin, an outer skin, and sandwiched therebetween a foamed or expanded plastics layer, and an outer tube of plastics material applied onto said inner tube.
- 35 2. A composite tube as claimed in claim 1 wherein the outer tube is extruded onto the inner tube.
3. A composite tube as claimed in claim 1 or claim 2 wherein the outer skin is smooth.
- 40 4. A composite tube as claimed in any of claims 1 to 3 which further comprises a reinforcing layer between the outer skin of the inner tube and the outer tube.
5. A composite tube as claimed in claim 4
- 45 wherein the reinforcing layer is composed of a reinforcing textile yarn.
6. A composite tube as claimed in claim 5 wherein the reinforcing textile yarn is braided onto the outer skin of the inner tube.
- 50 7. A composite tube as claimed in claim 5 or claim 6 wherein the reinforcing textile yarn is nylon.
8. A composite plastics tube substantially as herein described with reference to, and as shown
- 55 in, the accompanying drawing.